MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY FINAL EXAMINATION

TRIMESTER 1, 2022/2023 (TERM ID 2210)

TSE3351 – SOFTWARE EVOLUTION AND MAINTENANCE

(All sections / Groups)

8 FEB 2023
2.30 pm – 4:30 pm
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of 5 printed pages (including cover page) with 4 Sections only.

2. Attempt **ALL** questions in **SECTION A, SECTION B, SECTION C and SECTION D**. The distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

Attempt ALL questions in SECTION A, B, C and D.

Section A (12.5 marks)

Consider MRT Ticketing system includes two actors: **a traveler**, who purchases different types of tickets, and a **central computer system**, which maintains a reference database for the tariff. Use cases should include: *BuyOneWayTicket, BuyWeeklyCard, BuyMonthlyCard, UpdateTariff.* Also include the following exceptional cases: *Time-Out* (i.e., traveler took too long to insert the right amount), *TransactionAborted* (i.e., traveler selected the cancel button without completing the transaction), *DistributorOutOfChange,* and *DistributorOutOfPaper.*

Based on the above scenario, answer the following questions Q-A1 to Q-A4:

A1. How does a process of software evolution work for MRT Ticketing system?

[2.5 mark]

A2. What does software maintenance concern with? Explain **TWO (2)** reasons why software maintenance is important for the abovementioned MRT Ticketing system.

[3 mark]

A3. Based on a *Case Statement* above, design the use case diagram for a ticket distributor for a train system.

[5 marks]

A4. Explain **TWO (2)** factors (with at least an example for each factor) that lead the motivation for software maintenance in MRT Ticketing system.

[2 marks]

Continued...

Section B (12.5 marks)

At MBDA's Air-Defense Missile R&D laboratory, the Mission Design and Navigation Software Group (MDN) has two critical systems in operation a legacy navigation system and its replacement, the JERICHO system. These systems are in continual operation for most of MBDA's next-gen long-range missile defense programme. The development and maintenance of them is unquestionably critical to the success of this defense programme.

With over 1,500,000 lines of continually evolving code, MBDA-MDN team are clueless exactly what or when software maintenance and upgrade issues will surface. MBDA-MDN must plan to resolve them in a timely manner. The reality is that MBDA-MDN team is continually faced with exceptionally tight resources and schedule constraints. It is impractical to have a standing army of qualified maintenance staff at the ready to attack bugs and implement system enhancements and adjustments on demand. With these constraints and the inherent uncertainty in the demand for maintenance, it is unimaginable how MBDA-MDN could have successfully sustained JERICHO system over the past 10 years without reliance on their data models and analytics.

B1. Explain **TWO (2)** reasons why configuration management in software development differs from configuration management in software maintenance for the abovementioned JERICHO system.

[4 marks]

B2. What are the **THREE (3)** main responsibilities of the management in JERICHO system change control?

[1.5 marks]

B3a. What comprises a good software maintenance framework for the JERICHO system? What does SPE classification stand for?

[2 marks]

B3b. Explain why the SPE classification scheme is useful in software evolution. What are the **TWO (2)** qualities involving this SPE classification scheme?

[3 marks]

B4. Explain **TWO (2)** factors that prevent MBDA-MDN to undertake domain analysis in using a novel approach such as Microsoft Visual Studio.NET 2022 platform.

[2 marks]

Continued...

Section C (12.5 marks)

C1. Consider you're designing the access control policies for a Web-based E-Commerce fashion store. Customers access the store via the Web, browse product information, input their address and payment information, and purchase products. Suppliers can add new products, update product information, and receive orders. The store owner sets the retail prices, makes tailored offers to customers based on their purchasing profiles, and provides marketing services. You have to deal with three actors: *StoreAdministrator*, *Supplier*, and *Customer*. Design an access control policy for all three actors. *Customers* can be created via the Web, whereas *Suppliers* are created by the *StoreAdministrator*.

[5 marks]

C2. Consider a Web-based E-Commerce fashion store system architecture includes Web server and two database servers. Both database servers are identical: The first acts as a main server, while the second acts as a redundant backup in case the first one fails. Users use Web browsers to access data through the Web server. They also have the option of using a proprietary client that accesses the databases directly. The E-commerce systems also require undergoing maintenance every quarterly.

C2a. Design a UML deployment diagram representing the hardware/software mapping of this Web-based E-Commerce fashion system.

[3 marks]

C2b. To achieve the objectives of maintenance, a wide spectrum of change to the Web-based E-Commerce fashion store system may be necessary. Explain why it is important to categorize software changes.

[2.5 marks]

C2c. Discuss each of the following software change that will take affect from Web-based E-Commerce fashion store system.

i. Adaptive change.

[1 mark]

ii. Perfective change.

[1 mark]

Continued...

Section D (12.5 marks)

Consider a Human-Centered Robotics Mobile Applications Systems (HRS), where human–machine interaction in system engineering in robotics technology relies mostly on a two-way initiative: the humans instructor control robotics movement through remote mobile applications, while the mobile applications will transmit those instructions to the robot to move, interact, understand, and do what the humans had in mind. Moreover, the competencies of the remote mobile applications are presently more limited than those applied by humans when planning new software changes, upgrade or discussing development tasks. In the future, the HRS will initiate actions and suggestions based on deep knowledge and understanding of a broader range of goals and constraints than is possible today; covering knowledge that is not captured in the specification or code of the system at hand but, rather, comes from domain expertise or general world knowledge and human experience.

The innovative Human-Centered Robotics Mobile Applications (HRS) systems design is based on three main cornerstones:

- collecting, representing, and structuring knowledge about systems and problem domains through a common formalism (CF);
- conducting human-computer-robotics discourse about systems in natural and appealing ways through a special interaction language (IL); and
- rigorously analyzing and drawing conclusions from these knowledge items and interactions using a dedicated analysis engine (AE).

Based on the above scenario, answer the following questions Q-D1 to Q-D4:

D1. Explain **FIVE (5)** guidelines in producing good software tools documentation for HRS.

[5 marks]

D2. Software measurement is a process to quantify an attribute of a software tool and process. List at least **FIVE (5)** examples that we can measure the HRS software tool.

[2.5 marks]

D3. Explain **FOUR (4)** difficulties that you would expect in the context of HRS software reuse.

[2 marks]

D4. List **SIX (6)** benefits that can be derived from HRS software reuse.

[3 marks]

End of Paper